AMENDMENTS TO THE SPECIFICATION

Please amend the paragraph [0009] beginning on page 3, line 9 as follows:

Another embodiment of the present invention is directed to a method of optimizing the capacity of a MIMO system, the MIMO system characterized by K mobile units, each mobile unit characterized by Q levels, the K mobile units transmitting to a base station having n_T antennas configured to receive a signal transmitted by the K mobile units, the method comprising: (a) generating at least one positive, semidefinite channel matrices of size ~~n_T x n_T~~ n_R x n_T; (b) initializing at least one power control matrix and at least one beam-forming matrix; (c) partitioning a ~~K x n_T x n_T~~ K x n_R x n_T channel matrix space into a set of partition regions; (d) generating at least one power control matrix and at least one beam-forming matrix based on the at least one channel matrix, the at least one power control matrix, the at least one beam-forming matrix, and the set of partition regions; (e) repeating steps c and d a preselected number, N_g, of times; (f) estimating a capacity of the at least one generated power control matrix, the at least one generated beam-forming matrix, and the set of partition regions; (g) repeating steps a through f a preselected number, N_s, of times; and (h) selecting the at least one generated power control matrix, the at least one generated beam-forming matrix, and the set of partition regions corresponding to the largest capacity.

Please amend the paragraph [0029] beginning on page 9, line 3 as follows:

Referring to Fig. 2, a set of Q_T partition regions are initialized in step 210 where $Q_T = Q^K$. In step 210, a set of Q positive semidefinite matrices, denoted by $\{\mathbf{A}(q_i), q_i \in [0,Q-1]\}$ are randomly generated in step 210. Each matrix, $\mathbf{A}(q_i)$, is of size ~~n_T x n_T~~ n_R x n_T. The set of power control matrices for user k in a partition q_i is denoted by $\rho_k(q_i)$ and consists of the matrices $\{\rho_k(0),\ldots, \rho_k(Q-1)\}$ wherein each $\rho_k(q_i)$ corresponds to the eigenvalue matrix of $\mathbf{A}(q_k)$. The power control matrices are diagonal matrices of size ~~n_T x n_T~~ n_R x n_T having diagonal elements equal to the n_T eigenvalues of each $\mathbf{A}(q_k)$.

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A [[MIMO]] multiple-input, multiple-output (MIMO) system comprising:

at least one mobile unit configured to transmit a signal based on a selected power matrix and a selected beam-forming matrix; and

a base station configured to receive the signal from the at least one mobile unit, the base station comprising:

a [[CSIR]] channel state information – receiver (CSIR) estimator configured to receive the signal and estimate a channel matrix for the at least one mobile device; and

a [[CSIT]] channel state information – transmitter (CSIT) generator configured to broadcast an index to the at least one mobile unit, the index corresponding to a region of a channel matrix space enclosing the estimated channel matrix of the at least one mobile unit;

wherein the selected power matrix and the selected beam-forming matrix are selected based on the index broadcast by the CSIT generator.

2. (Original) The MIMO system of claim 1 wherein the at least one mobile unit further comprises:

at least one antenna configured to transmit a signal to a base station;

a transmitter configured to transmit a signal containing an encoded data stream over the at least one antenna;

an index decoder configured to receive a partial feedback signal and extract an index associated with the mobile unit from the partial feedback signal; and

a power and beam-forming control configured to retrieve a power control matrix and beam-forming matrix from a set of pre-stored power control and beam-forming matrices based on the extracted index;

wherein the transmitter generates the transmitted signal by modifying the encoded data stream with the retrieved power control matrix and beam-forming matrix.

3. (Original) The MIMO system of claim 1 wherein the selected power matrix and selected beam-forming matrix are selected from a set of transmission matrices, each member of the set comprising a power matrix and a beam-forming matrix and representing a partition of a channel matrix space of size K x n_R x n_T where K is a number of mobile units within a cell of the base station, each mobile unit transmitting on n_R antennas, the base station transmitting on n_T antennas, the set of transmission matrices generated to optimize the capacity of the system.

4. (Original) The MIMO system of claim 3 wherein the set of transmission matrices is generated at the base station.

5. (Currently Amended) The MIMO system of claim 3 wherein the optimized set of transmission matrices is generated by a method comprising:

a. generating at least one positive, semidefinite channel matrices of size ~~n_T x n_T~~ $\underline{n_R \text{ x } n_T}$;

b. initializing at least one power control matrix and at least one beam-forming matrix;

c. partitioning a ~~K x n_T x n_T~~ $\underline{\text{K x } n_R \text{ x } n_T}$ channel matrix space into a set of partition regions;

d. generating at least one power control matrix and at least one beam-forming matrix based on the at least one channel matrix, the at least one power control matrix, the at least one beam-forming matrix, and the set of partition regions;

e. repeating steps c and d a preselected number, N_g, of times;

f. estimating a capacity of the at least one generated power control matrix, the at least one generated beam-forming matrix, and the set of partition regions;

g. repeating steps a through f a preselected number, N_s, of times; and

h. selecting the at least one generated power control matrix, the at least one generated beam-forming matrix, and the set of partition regions corresponding to the largest capacity.

6. (Original) The method of claim 5 wherein the at least one power control matrix is a diagonal matrix having a diagonal element equal to an eigenvalue of the at least one channel matrix.

7. (Original) The method of claim 5 wherein the at least one beam-forming matrix is hermitian matrix corresponding to an eigenmatrix of the at least one channel matrix.

8. (Original) The method of claim 5 wherein the channel matrix space is partitioned such that every channel matrix within the partition is closest to the same at least one generated power control matrix and the at least one generated beam-forming matrix.

9. (Currently Amended) A method of optimizing the capacity of a MIMO system, the MIMO system characterized by K mobile units, each mobile unit characterized by Q levels, the K mobile units transmitting to a base station having n_T antennas configured to receive a signal transmitted by the K mobile units, the method comprising:

i. generating at least one positive, semidefinite channel matrices of size ~~n_T x n_T~~ $\underline{n_R \text{ x } n_T}$;

j. initializing at least one power control matrix and at least one beam-forming matrix;

k. partitioning a ~~K x n_T x n_T~~ K x n_R x n_T channel matrix space into a set of partition regions;

l. generating at least one power control matrix and at least one beam-forming matrix based on the at least one channel matrix, the at least one power control matrix, the at least one beam-forming matrix, and the set of partition regions;

m. repeating steps c and d a preselected number, N_g, of times;

n. estimating a capacity of the at least one generated power control matrix, the at least one generated beam-forming matrix, and the set of partition regions;

o. repeating steps a through f a preselected number, N_s, of times; and

p. selecting the at least one generated power control matrix, the at least one generated beam-forming matrix, and the set of partition regions corresponding to the largest capacity.

10. (Original) The method of claim 9 wherein the at least one power control matrix is a diagonal matrix having a diagonal element equal to an eigenvalue of the at least one channel matrix.

11. (Original) The method of claim 9 wherein the at least one beam-forming matrix is hermitian matrix corresponding to an eigenmatrix of the at least one channel matrix.

12. (Original) The method of claim 9 wherein the partition index is a K component vector, each component of the vector representing a level of the at least one mobile unit.

13. (Original) The method of claim 12 wherein the component is expressed in base-Q.

14. (Original) The method of claim 9 wherein the channel matrix space is partitioned such that every channel matrix within the partition is closest to the same at least one generated power control matrix and the at least one generated beam-forming matrix.

15. (Original) The method of claim 9 further comprising storing the selected at least one power control matrix and the at least one beam-forming matrix in each of the K mobile units.

16. (Original) The method of claim 9 further comprising storing the set of partition regions in the base station.

17. (Original) A MIMO wireless base station comprising:

at least one antenna configured to receive a signal from at least one mobile unit;

a receiver configured to receive the signal from the at least one antenna;

a CSIR estimator configured to estimate a channel matrix for the at least one mobile unit based in part on the signal from the at least one antenna; and

a CSIT generator configured to broadcast to the at least one mobile unit a partition index corresponding to a partition containing the channel matrix of the at least one mobile unit.

18. (Original) A MIMO wireless mobile unit comprising:

at least one antenna configured to transmit a signal to a base station;

a transmitter configured to transmit a signal containing an encoded data stream over the at least one antenna;

an index decoder configured to receive a partial feedback signal and extract an index associated with the mobile unit from the partial feedback signal; and

a power and beam-forming control configured to retrieve a power control matrix and beam-forming matrix from a set of pre-stored power control and beam-forming matrices based on the extracted index;

wherein the transmitter generates the transmitted signal by modifying the encoded data stream with the retrieved power control matrix and beam-forming matrix.

19. (Original) A method for optimizing the capacity of a MIMO wireless system with partial feedback, the system characterized by K mobile units having Q levels, each mobile unit characterized by a channel matrix, the channel matrix embedded in a $K \times n_R \times n_T$ dimension channel matrix space, the method comprising:

(a) partitioning the matrix space into Q^K regions, $\{\mathbf{R}_q\}$;

(b) determining an optimal set of Q^K power control matrices, $\{\rho_q\}$, and an optimal set of Q^K bream-forming matrices, $\{\mathbf{B}_q\}$ based on $\{\mathbf{R}_q\}$;

(c) estimating a capacity of the MIMO system based on $\{\mathbf{R}_q\}$, $\{\rho_q\}$, and $\{\mathbf{B}_q\}$;

repeating steps (a) through (c) a predetermined number of times; and

selecting a set of $\{\mathbf{R}_q\}$, $\{\rho_q\}$, and $\{\mathbf{B}_q\}$ having the largest estimated capacity.